REMARKS

The first paragraph of the specification has been amended to provide the serial number of the related application. In addition, a number of the paragraphs of the specification have been amended to correct minor typographical, grammatical and idiomatic errors that appeared in those paragraphs. Several paragraphs have also been amended to conform their descriptions to other portions of the specification, thereby improving the overall clarity of the disclosure. In this regard, the paragraph beginning at page 7, line 15 was amended to refer to the appropriate groups of the periodic chart for the corresponding elements listed. In addition, the paragraph was amended to correct the atomic symbols for Zr, Er, and Tm. The latter amendments are supported by, for example, the text on page 9 of the specification. The paragraph spanning pages 10 and 11 of the specification was amended to better conform to the illustration in Fig. 6. The paragraphs beginning at page 11, lines 10 and 16, and page 12, line 11, were amended to conform their description to that contained in the paragraph spanning pages 2 and 3 of the specification. The first line of the paragraph beginning at page 12, line 11, was also amended to conform the description of Fig. 8 to that contained in the brief description of the drawings on page 5 of the specification. The paragraph beginning at page 14, line 3 was amended to correct the description of figure 14. As would be apparent to one skilled in the art, the portions of the mask corresponding to the channels formed in the device of Fig. 13 would range from almost totally black to clear (i.e., from little light transmitted through the mask to complete transmission of the light from the light source used to expose the sol-gel film). Similarly the regions between the channels would be black as opposed to clear so that they would remain unexposed in accordance with the teachings throughout the specification. This error has also been corrected in amended Fig. 14. The paragraph beginning at page 15, line 4, and the paragraph spanning pages 15 and 16 have been amended so that they refer to the reference numbers contained

in Figs. 17 and 18, respectively. The original description was inverted in this respect. In addition, reference numbers 164, 165 were added to the paragraph spanning pages 15 and 16 to more clearly reference the described spacing in Fig. 18. Finally, the paragraph beginning at page 16, line 2 has been amended to correct the reference number 182 for the second film in Fig. 19.

In amended Fig. 18, reference numbers 164, 165 have been added in view of the corresponding amendment to the paragraph spanning pages 15 and 16 of the specification. Fig. 17 has been amended to include reference number 169 and a prior art notation, consistent with the description of Fig. 17 in the specification.

All of the foregoing amendments are supported by the specification and drawings as originally filed. Accordingly, no new matter has been added.

Turning to the claims, claims 1-18 and 20-46 remain in this application. Claim 19 has been cancelled. Claims 12-14, 31, and 32 have been withdrawn. And, claims 33-46 are newly presented in this paper.

Claims 1 and 11 have been amended to remove the parenthetical expressions objected to by the Examiner, thereby mooting the Examiner's objection to those claims. A number of the other original claims have also been amended to put them in better form. For example, the preamble of all of the pending, non-withdrawn claims have been amended to place them in better form. In addition, claim 4 has been amended to delete unnecessary limitations and to broaden the alternating region limitation in recognition of the fact that the grating can be formed by alternating regions of different concentration of photodeposited metal oxide, including alternating with regions of no photodeposited metal oxide. Claim 5 has been amended in view of the amendments to claim 4 and

to simplify the limitation used to claim the grating spacing. Claim 6 has been amended to expressly state the implicit limitation that the waveguide channel has a higher refractive index than the surrounding portions of the sol-gel film and to clarify that the metal oxide is photodeposited. The limitations of claim 7 have been clarified. Claim 8 has been amended to simply the claimed metals and the differences in refractive indexes between the plurality of metal oxide waveguides. Finally, claims 20 and 21 have been amended to simplify and broaden the limitations set forth therein.

The various claim rejections will now be addressed in the order raised in the Office Action.

The 35 U.S.C. § 102 Rejections

Claims 6 and 15 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Najafi et al.'s September 1998 Journal of Lightwave Technology article (Ref. AN in the Information Disclosure Statement filed August 19, 2002). Applicant respectfully traverses.

Claim 6 claims an apparatus comprising a substrate having a silica surface layer and a thin sol-gel glass film thereon. The thin sol-gel film includes therein at least a first metal oxide waveguide channel having a comparatively high refractive index as compared to surrounding portions of said thin sol-gel film, wherein the metal oxide is photodeposited.

Claim 11 claims an apparatus comprising a substrate having a silica surface layer and a thin sol-gel glass film thereon. The sol-gel film includes therein at least first and second photodeposited metal oxide waveguide channels, said channels being in close proximity only in a first region thereof, and said apparatus includes signal-responsive means for switching light signals from said first to said second channel controllably.

By contrast, Najafi et al fails to teach or suggest an apparatus comprising a substrate having a silica surface layer and a thin sol-gel glass film thereon, wherein the thin sol-gel film includes therein at least a first metal oxide waveguide channel and wherein the metal oxide is photodeposited. Rather, to the extent that Najafi et al teaches metal oxide network modifiers, those metal oxides are formed through additions of metal alkoxides of zirconium and aluminum to the sol-gel mixture. Modifying the sol compositions with metal alkoxides to introduce variations in the refractive index of the sol-gel derived glass film is well known. However, such additions result in the same refractive index modifications being made throughout the film. This is because the metal oxides formed from such metal alkoxides are formed through the hydrolysis of the sol and its subsequent polymerization by condensation. Indeed, the metal alkoxides are not what make the sol-gels taught in Najafi et al photosensitive.

In this regard, Najafi et al teaches the use of organically modified silicates, which Najafi el al also refers to as a hybrid sol-gel glasses (HSGG). (Najafi et al, p. 1640, right column.) Najafi et al further teaches that the "photopolymerizable organosilicate framework was provided [in the described experiments] by methacryloxypopyltrimethoxysilane (MAPTMS). As described in U.S. Patent No. 6,054,253, which was filed in 1997 by several of the authors of the Najafi et al article, including Najafi, MAPTMS has the following chemical composition: $(H_2C=C(CH_3)CO_2(CH_2)_3Si(OCH_3)_3)$. ('253 Patent, col. 2:37-38 (a copy of the '253 Patent was submitted as reference AB in the August 19, 2002 Information Disclosure Statement).) A photoinitiator (IRGACURE 184®) is added to the MAPTMS mixture to photoinitiate the polymerization of the vinyl monomer substituent of the MAPTMS molecules. (*See e.g.*, Najafi et al at p. 1641, left column; *see also* '253 Patent, col. 5:9-15 and 5:59-61.) Hence, exposure of the

deposited MAPTMS based sol-gel film to deep UV radiation induces free radical polymerization of the of the vinyl substituents on the MAPTMS molecules, thereby raising the refractive index of the gel matrix in those regions. (*Id.*) Najafi et al, therefore, does not teach or suggest photodepositing metal oxide network modifiers in a thin sol-gel derived glass film. Nor does Najafi et al anticipate or render obvious claims 6 and 11.

The 35 U.S.C. § 103 Rejections

Claims 1-5, 7-11, and 15-30 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Najafi et al. Applicant respectfully traverses.

Claim 1 claims an apparatus having a sol-gel film with a channel that comprises a metal oxide doped silica region between regions of silica. In addition, claim 1 requires the metal oxide to be photodeposited from an organometallic photosensitizer. Thus, for the reasons noted above, Najafi et al fails to teach or suggest the apparatus of claim 1 or its dependent claims. Moreover, Najafi et al fails to teach or suggest the use of an organometallic photosensitizer to form a photodeposited metal oxide in a sol-gel film.

Claims 7-10 depend from claim 6 and hence are patentable for the reasons noted above. Independent claim 11 is similarly patentable over Najafi et al for the reasons noted above.

Independent claim 15 requires the photosensitive sol-gel film to include at least a first channel having an index of refraction that varies continuously along at least a portion of the channel. Najafi et al does not teach or suggest the production of a waveguide having a continuous variation in its refractive index along at least a portion of its length. Accordingly, Najafi et al fails to teach or suggest claim 15 and its corresponding independent claims.

With respect to new independent claim 34, Najafi et al fails to teach or suggest the production of embedded waveguide channel in a sol-gel derived film layer, wherein the channel has different concentrations of a photodeposited metal oxide along the axis of the channel. Accordingly, claim 34 and its corresponding dependent claims are not anticipated or rendered obvious by Najafi et al.

New independent claim 40 is directed to an integrated device having a photosensitive sol-gel derived film layer disposed on a substrate, wherein the sol-gel film includes a plurality of embedded waveguide channels each having a different photoinduced refractive index profile along its axis. Thus, Najafi et al fails to teach or suggest the limitations of claim 40 or its dependent claims.

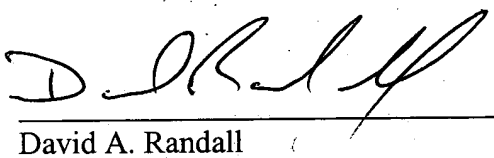
CONCLUSION

In view of the foregoing, reconsideration and allowance of this application are earnestly solicited.

Respectfully submitted,

JONES DAY

Dated: April 9, 2004

By: 

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